

SuperDARN and EISCAT observation of artificially induced field aligned irregularities (4)

Akira Sessai Yukimatu[1]; Koji Nishimura[2]; Yasunobu Ogawa[3]; Masaki Tsutsumi[3]; Natsuo Sato[3]; Mike T. Rietveld[4]; Darren Wright[5]; Tim Yoeman[5]; Mark Lester[5]

[1] NIPR (SOKENDAI, Polar Science); [2] TRIC, ROIS.; [3] NIPR; [4] MPAE, EISCAT; [5] Univ. Leicester

Ionospheric field aligned irregularities (FAIs) are targets from which SuperDARN HF radars receive backscatter echoes, and their elementary creation and decay processes have been investigated by many researchers long years but not fully understood yet. To reveal the physical processes, FAIs artificially induced by EISCAT heater facility at Tromso have been observed by CUTLASS Finland and Iceland East SuperDARN radars and EISCAT Tromso UHF radar. Raw IQ time series observation and analysis technique (TMS methods) [Yukimatu and Tsutsumi, GRL, 2002] was applied to SuperDARN observation and 3 spectral components were identified and found that their temporal evolutions differ when the heater is turned on and off. Large fluctuation of echo amplitude and phase 'leaps' are also found, which suggest that a limited number of soliton-like FAIs exist within an observed range-bin and are created and decayed intermittently and long lived (~10 sec) FAIs also coexist in the same heated region. To investigate whether the speculation above is valid, multi-frequency frequency domain interferometer (FDI) technique was firstly and successfully applied to SuperDARN observation. The simultaneous EISCAT UHF radar observation detected the heated region in 2-dimensional space and also showed at least 2 examples of large amplitude fluctuation of echo power from the heated region, suggesting ion acoustic wave activities. The observational results are shown and the physical processes of FAIs will be discussed. Existing observational problems and possible improved FAI observation methods will also be discussed.